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AND

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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

February 21st to March 20th inclusive.

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RANKINE'S MISCELLANEOUS SCIENTIFIC PAPERS.

"Rankine's Miscellaneous Scientific Papers." By W. J. Macquorn Rankine, F.R.S. With a Memoir of the Author by P. G. Tait, M.A. Edited by W. J. Miller, C.E. (Griffin & Co.)

Prof. Rankine has always been esteemed as a man of such scientific eminence that it is needless to speak in praise of his works, which may be considered as enrolled, so to speak, amongst the classics of practical science. After his death a volume, to consist of his more important papers, to be edited by two eminent engineers, Mr. Lewis D. B. Gordon and Mr. James R. Napier, was projected, and although these gentlemen have died, the project has not lapsed, and the result is a handsome octavo volume of 567 pages.

The selected papers form parts i., ii., and iii. of the volume. Part i. consists of nine papers relating to the temperature, elasticity, and expansion of vapours, liquids, and solids; part ii. of nineteen papers, relating to energy and its transformations, thermodynamics, and steam-engines; part iii. of nine papers on wave-forms, stream-lines, propulsion of vessels, and stability of structures.

The memoir is by Prof. Tait and is judicious and interesting. An estimate of Rankine's work by Clark Maxwell, which is reproduced in his memoir, states :—"Of the three founders of theoretical thermodynamics, Rankine availed himself to the greatest extent of the scientific use of the imagination. His imagination, however, though amply luxuriant, was strictly scientific. Whatever he imagined about molecular vortices, with their nuclei and atmospheres, was so clearly imaged in his mind's eye, that he, as a practical engineer, could see how it would work. However intricate, therefore, the machinery might be which he imagined to exist in the minute parts of bodies, there was no danger of his going on to explain natural phenomena by any mode of action of this machinery which was not consistent with the general laws of mechanism. Hence, though the construction and distribution of his vortices may seem to us as complicated and arbitrary as the Cartesian system, his final deductions are simple, necessary, and consistent with facts. Certain phenomena were to be explained. Rankine set himself to imagine the mechanism by which they might be produced. Being an accomplished engineer, he succeeded in specifying a particular arrangement of mechanism competent to do the work, and also in predicting other properties of the mechanism which were afterwards found to be consistent with observed facts. . . The scientific career of Rankine was marked by the gradual development of a singular power of bringing the most difficult investigations within the range of elementary methods. In his earlier papers, indeed, he appears as if battling with chaos, as he swims, or sinks, or wades, or creeps, or flies,

And through the palpable obscure finds out
His uncouth way;

but he soon begins to pave a broad and beaten way over the dark abyss, and his latest writings show such a power of bridging over the difficulties of science, that his premature death must have been almost as great a loss to the diffusion of science as it was to its advancement."

Rankine was born at Edinburgh in 1820, and died in 1872. Besides about 200 papers, he published six standard text books, viz., "A Manual of Applied Mechanics," "A Manual of Civil Engineering," "A Manual of Machinery and Millwork," "A Manual of the Steam-Engine and other Prime Movers," "Useful Rules and Tables for Engineers, Surveyors, and Others," and "A Mechanical Text-Book." We feel it to be superfluous for us to speak of the great value of this work, which will doubtless be admitted by every reader of it.

RAMSEY'S SCIENTIFIC ROLL.

"The Scientific Roll and Magazine of Systematised Notes." Conducted by Alexander Ramsey, F.G.S. Climate. Vol. 1. Bradbury, Agnew, & Co.

This work may apparently be characterised as a number of essays or treatises on various scientific subjects. The conductor solicits help in the prosecution of the task which he has undertaken, and asks authors to afford aid by favouring him with lists of the articles and books written by them, specifying the dates of publication, and in the case of papers the days on which they were read before the several societies. Still more valuable help would be given by their forwarding copies of their literary productions. These would be returned, if required, after they have been read. Publishers are solicited to send catalogues of their scientific publications, and Librarians to afford assistance by obliging the conductor with catalogues of the libraries under their charge, more especially such as have the titles arranged according to subjects. Prospectuses and samples of the "Scientific Roll" will be forwarded to any persons willing to give such assistance.

MURBY'S SCHOOL BOOKS.

"Murby's Imperial Grammars for the Code of 1880."

Mr. Murby again presents us with some valuable little school books, namely, grammars adapted to the various standards to VI. inclusive. Mr. Murby is now pretty well known as a reliable caterer for the wants of elementary instruction, and we may truly say that we can discover nothing in these little works that is not worthy of praise. There are, it is true, much to be repudiated as really antagonistic to a good system of teaching very young people (unless they are expected to be comprehended under the term "prigs") in the use of the terms "subject," "object," "predicate," and so forth; but as our educator wind-bags have decreed that these learned terms shall be thrust *volens nolens* into the craniums of our future men of spade-work, trowel-work, and hammer-work, this is, of course, no fault attributable to Mr. Murby's works.

The Dragon a Reality.—Many years ago, the learned Professor Owen had sent to him some bones, from which he foretold the probable discovery of the skeletons of the carnivorous kangaroo, and of the gigantic birds of New Zealand, and these have since been found; but he also received a few fossil remains, from which he believed that a great horned dragon, with a vast mouth full of teeth, and with powerful claws and a barbed tail, had once lived in Queensland. The tail and middle portions of this beast have since been forwarded to the learned Professor, and the great horned dragon or gigantic lizard can now be pictured with a tail of "annular segments," each supporting two pairs of horns or spikes, and each segment measuring ten inches, with wings which would enable the monster to mount into the air, and with the power of hybernating like the sloth. Here we have the regular dragon, with a family likeness to that which was slain by St. George, or by More of Wantley. Some of the other monsters of Australia which lived in the prehistoric ages of the world are gigantic and strange, but this, which is called the *Megalania presia*, seems the most terrible. A whole one has not been found yet, we only get at him a little at a time.—*Boys' Newspaper.*

PATENT LAW REFORM.

The Petition prepared by the Patent Law Reform Committee, composed of Inventors and others interested in the progress of invention, whether members of the Inventors' Institute or not in membership therewith, which Petition is in the course of circulation for signature, is as follows :—To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament assembled. The Humble Petition of the undersigned and other persons having an interest in the Patent Laws :—Sheweth—1. That your petitioners are inventors, engineers, chemists, mechanics, manufacturers, artisans, workmen, and persons professionally and commercially engaged in devising and practically applying new inventions, or otherwise interested in the commercial and industrial prosperity of the United Kingdom. 2. Your petitioners, from their own knowledge and experience, are convinced that the Patent Laws of the United Kingdom in their present state materially impede industrial progress. 3. Other countries, especially the United States of America, under cheaper and better legislation in matters relating to inventions, notwithstanding the serious disadvantages under which many labour, have made such industrial advances as to alarm us as to our position of almost uncontested superiority in the mechanical and chemical arts. Indeed, in some branches of industry it is questionable whether we shall not be driven out of the market entirely by our foreign competitors, who, as above stated, live under laws which do not tend as do those of this country to suppress, but, on the contrary, really do promote invention. 4. In order to relieve the inventiveness of this country from the burdens which now oppress it, and give it the protection and encouragement to which it is entitled, and thus enable the industry of England to compete on fair terms with that of other countries, it is absolutely necessary that patents should be granted at very much lower cost and afford much greater effectiveness. 5. Endeavours to improve our arts and manufactures by technical education, or by other means, are rendered almost useless while laws exist which practically discourage and repress invention and deprive the inventor of all benefit from the exercise of such education in such endeavours. 6. The bill intituled "The Patents for Inventions Bill, 1881," and brought into your Honourable House by Messrs. Anderson, Alexander Brown, Hinde Palmer, and Broadhurst, has been brought under the notice of your petitioners, and although it does not profess to deal with some important points of Patent Law which are well worthy of attention and have been long advocated with public approval by the Inventors' Institute and other Patent Law Reformers, is yet so vast an improvement on the present Patent Law as regards cheapening the cost of patents, longer duration of same, and improvements in the administration of the Patent Office, as to be worthy of your petitioners' support. Your petitioners therefore humbly pray that your Honourable House will be pleased to take these matters into your consideration, and to pass the said bill into a law, and so give great relief to your petitioners. And your petitioners will ever pray, &c.

CORROSION OF IRON AND STEEL.

At the meeting of the Institute of Civil Engineers on Tuesday, the 22nd of March, Mr. Abernethy, F.R.S.E., President, in the Chair, the Paper read was on "The Comparative Endurance of Iron and Mild Steel when exposed to Corrosive Influences," by Mr. D. Phillips, M. Inst. C.E.

The results were given of numerous tests, the surfaces of the specimens in nearly all cases being bright. Illustrations were shown of gutta-percha and plaster of Paris impressions taken from many of the specimens. Tubes of different brands of iron and steel were subjected to various tests in a special apparatus at Sheerness Dockyard. Some of the tubes were welded, others were cold drawn; with one exception, they were all specially prepared. Each tube had an exposed surface of 9·58 square feet. The iron tubes lost 45·4 per cent. less in weight than the steel. Small disks of iron and steel were also tested in another set of tubes in the same apparatus. The percentage in favour of the irons was 56·7. Pieces of iron and steel of different brands were suspended for twelve months in two marine boilers, one vessel having a jet condenser, and the other a surface condenser, and also in a feed-water-heater, supplied with fresh water. The percentages in favour of the irons were 32·7, 27·5, and 11·8 respectively. Plates of Bolton steel and Lowmoor iron, 10 inches by 8 inches, were likewise placed in the boilers of the two vessels mentioned. Half of the number were withdrawn after thirteen months, and gave a percentage in favour of the irons of 32·7,—corrosion in the steels, in the form of pitting, being most marked. Of the remaining eight plates, four remained in the boilers twenty-one months and four twenty-two months, the result being 28·6 per cent. in favour of the irons. Plates of the same two metals, 15 inches by 8 inches, were suspended for thirteen months in the feed-water-heater. The percentage in favour of the irons was 10·9. The corrosion in the steels was only slightly more marked and irregular than in the irons. Plates of Lowmoor iron and Landore steel, suspended in pairs in vessels under slighly different conditions, gave a percentage of 4·8 in favour of the irons.

The author next referred to a series of experiments with iron and steel plates (crucible, Bessemer and Siemens steels, and Staffordshire and Yorkshire irons), suspended in the boilers of ocean and coast-going steam vessels belonging to various shipowners. The exposed surface of each plate was 37·89 square inches. Taking the results from fifty-six sets the percentage in favour of the two irons over the Bessemer and Siemens steels was 21·3. The different results obtained from some of the sets might be thus summarised.—No. 43 set was suspended in the boiler 285 days. The boiler was filled fourteen times with fresh water, 2 inches of water being blown off daily. No. 2 set was in the boiler 311 days. The boiler was filled eight times with fresh water, and five times with sea-water, 3 inches of water being blown off daily at sea, and 12 inches at intermediate ports. The mean loss of weight in No. 2 set was 825·4 grains, as compared with 347·7 grains in No. 43 set, or nearly 2½ times as much. Boiler 62 was filled five times with fresh water, 1 inch of water being blown off daily. The plates were in the boiler for 298 days. The mean loss of weight was 364·9 grains, as compared with 825·4 grains in No. 2 set. Set 84 was in the boiler 43 days, the boiler being filled four times with sea water and once with fresh water, an average of 73 inches of water being blown off daily. The mean loss of weight was 575·7 grains as against 364·9 grains in 62 set, being at the rate, per month of thirty days, of 401·78 grains in 84 set, against 36·7 grains in 62 set. Comparing set No. 9, which was suspended in a jet-condensing boiler, with 62, which was subjected to something like the most improved method of surface-condensing treatment, the loss in No. 9 was nearly four times that in No. 62 set. These results clearly proved the error of the conclusions arrived at by many experienced persons previous to the appointment of the Boiler Committee.

Experiments made by the author with plates similar to those last mentioned, placed in sea water, in rain water, exposed to the weather only, and exposed to the weather and dipped in sea or rain water daily, gave a result of 64·8 per cent. in favour of the irons, omitting the hard steel. The corrosion was strikingly local and severe in the set placed in the rain water. Wetting the metals daily, especially with sea water, and exposing them to the weather, caused very severe corrosion. The results of these experiments incontestably proved, that under almost all circumstances iron, especially the harder sorts, was far superior to steel in the resistance it offered to corrosion.

The author remarked that, in his opinion, such theories as that corrosion was caused by galvanic action between metals and their oxides, or between different brands of iron or steel, or between iron and steel, were practically unworthy of consideration. He then proceeded to say that steel had probably received more than its fair share of praise as regarded homogeneity and uniformity of temper. Although iron was inferior to steel as regarded cinders, laminations, &c., yet mild steel was not without original defects, as was shown by several of the gutta-percha impressions. Moreover, some of the tubes and disks before mentioned presented after testing a damaskeen appearance similar to gun-barrels.

Surprising differences of temper were exhibited in the cold bending of the metals tested in the tube apparatus, not only between the various brands, but also between the tubes of each brand. The difference between the behaviour of the tempered and the annealed steel specimens under the cold bending test was also most marked.

It would seem that in the purifying of metals, in order to render them more ductile, elements, such as carbon, phosphorus, &c., were eliminated, which no doubt rendered the metals more liable to corrosion. In the metals tested in sea-going boilers, the ordinary BB Staffordshire iron proved 9·6 per cent. better than the best Yorkshire, as regarded loss of weight, and the harder steel 20·9 per cent. better than the two mild steels. In the tube experiments, the ordinary iron tubes proved 122·2 per cent. better than those specially prepared. Again, the tubes called "Improved Metal" were 31·1 per cent. better than the tubes called "Improved Homogeneous Metal," by far the most ductile and expensive of the two.

It appeared from recent analyses, that the percentage of phosphorus ranged from 0·20 to 0·21 in the cruder irons, from 0·7 to 0·14 in the better sorts, and from 0·016 to 0·04 in the milder steels. The amount of carbon in iron ranged from 0·0545 to 0·074 per cent., whilst in mild steel it varied from 0·131 to 0·273 per cent. From 0·0649 to 0·1080 per cent. of manganese was found in iron, and from 0·238 to 2·3317 per cent. in steel. These results confirmed the author's conclusions, that the commoner irons, containing the most phosphorus, resisted corrosion better than the superior sorts, and the harder steels, containing the most carbon, better than the softer and finer sorts.

In conclusion, the author remarked that much yet remained to be done to produce a metal at once strong and ductile, but at the same time better able than mild steel to withstand corrosion, On the other hand, the treatment of marine boilers might be so modified, especially with the aid of zinc properly applied, as to enable the purer metals to be used in their construction.

A NEW TELEPHONE.

A PAPER "On the Conversion of Radical Energy into Sonorous Vibrations" was recently read before the Royal Society by Mr. W. H. Preece, the electrician to the Post Office. The remarkable discovery of Messrs. Graham Bell and Summer Tainter, that the rapid intermittent incidence of rays of light on discs of hard substances produces sonorous vibrations, has attracted very much attention and has excited much physical work to solve an unexpected problem. The advocates of the emission theory of light have striven for 200 years to obtain such a proof of their theory and have failed. Why have Bell and Tainter succeeded, or have they succeeded at all? May not their phenomena be due to some other cause than to the incidence of light? It was suspected by many that it was a heat effect, and not a light one at all. M. Mercadier, in Paris (Comptes Rendus, Dec. 6, 1880), and Professor Tyndall (Proc. R.S., Jan. 3, 1881) have placed this beyond the region of doubt, and now Mr. Preece has completed the chain of evidence by a careful and elaborate inquiry into the cause of the phenomena. In the first part of his paper he has shown that ebonite and indiarubber, though opaque to the light rays, are remarkably diathermanous or transparent to the heat rays, and therefore that radiant heat can act through screens of those materials. Indeed, ebonite is shown to be most perfectly transparent to radiant heat, while it is absolutely impervious to light. He next shows by experiments made on very delicate apparatus that no more vibrations than six per second can possibly be produced by the direct inpact of heat waves causing expansion of the mass of the disc, and therefore that the Bell-Tainter effect is not due to the absorption of heat changing the volume of the hard substance experimented upon. He next inquires whether the effect observed is due to a molecular pressure similar to that which produces the rotation of the radiometer, for this being a mere surface action, the element of time is eliminated. Many experiments are described which were made with discs of various kinds in different ways, but the results were so unsatisfactory and variable that the question was raised whether the discs vibrated at all. By the aid of microphones and specially constructed chambers, it is proved clearly that the undulations are those of the contained air, and not of the discs. In fact, the sounds were intensified by removing the discs. Moreover, the effects were materially assisted by coating the sides of the containing vessel with a substance highly absorbent of heat, such as the carbon deposited by buring camphor. It is next shown that the effects are dependent on the number of heat rays that pass through the discs, and not on those that are incident on them, and that the greater the absorbent character of the air or vapour contained in the case, the more intense the sounds emitted. All these results are repeated and shown with ordinary flasks lampblacked on their exterior and interior. Finally it is shown that there is a time element introduced, and that the loudness of the note emitted depends not only on the rapidity with which the contained air absorbs the radiant energy, but also on the rapidity with which it gives up its heat to the sides of the case and the exits open to it. It varies also with the form of the enclosed space and with the character of the contained vapour, and with the diathermancy only of the discs. The effect being thus due to radiant heat and its absorption by suitable surfaces it was next shown that if a spiral of wire be completely enclosed in a lampblacked case, sounds were emitted when currents of electricity were rapidly and intermittently transmitted through the wire, and, moreover, that when these currents were produced by a proper microphone transmitter articulate speech was reproduced. Hence these phenomena are simply effects of radiant heat, and they are due to the changes of volume in absorbent gases and vapours produced by the absorption of thermometric heat in a confined space. All the varied and novel experiments which Mr. Graham Bell performed when he was recently in Europe with solids, liquids, and gases, with tubes, flasks, and discs are thus brought within one simple explanation, and are due to a remarkable influence of degraded heat rays on absorbent vapours. The final result of this inquiry has been, not only to unravel an exceedingly interesting scientific problem, but to produce another form of telephone based on a new principle.

SOME "HAPPY THOUGHTS."

UNDER this heading our contemporary the *Globe* makes merry over some of the peculiarities of our Patent Lists in this fashion:

"In our ably-conducted contemporary, *Engineering*, there is some amusing reading this week in the columns recording recent applications for patents. The inventor seems to be very busy just at present, more than 100 applications having been sent into the Patent Office during a single week. Among these we find aerial navigation claiming a fresh victim, a firm having devised some new apparatus which is certain, of course, to enable human beings to fly whither they choose. From Dresden there comes a claim to have discovered a method by which elastic lining may be fitted to closed vessels, such as beer casks, containing liquids. It is not easy to imagine what good could come of that, but the inventor no doubt believes he has hit upon a brilliant idea. The French gentleman who wants a patent for a new process of "illustrating soap cakes" may possibly make profit out of his ingenuity, as there is plenty of room for the artistic embellishment of the article. If the Paris firm who believe they have devised the means 'for preventing collisions on railways,' can only make good the pretension, they will confer an inestimable benefit upon the human race, as well as make an enormous fortune. This can scarcely be predicted of the English inventor who applies for a patent for 'an apparatus for turning over leaves of music, &c.' Does the '&c.' include the 'new leaf' which repentant folks are so fond of turning over prospectively? A Viennese comes forward with rather a happy notion, 'an apparatus for cleaning and rolling up carpets,' but we must protest against the perverse ingenuity which influenced a Birmingham inventor to cudgel his wits for 'coffiin handle mounts *applicable to other purposes*.' We very much prefer the new trap for mice and rats introduced by another genius; this quietly drops its victims into a condemned cell underneath the compartment in which the bait is displayed, and keeps them safely there pending execution.

A SCIENTIFIC RAILWAY CAR.

THERE arrived at our depot, a short time since, a passenger car the like of which is not to be found anywhere in the world. It is the property of Mr. P. H. Dudley, inspector of the tracks and apparatus of railroads, and this gentleman and his wife live in this car. A reporter of the "Sun" called on the occupants yesterday afternoon, and was entertained for nearly an hour with the explanations of and experiments made with the large piece of machinery by which the gentleman accomplishes his work. It is of the most complicated and delicate nature, and the amount of work done by it is marvellous. A description of it would be wearisome, with its systems of cogs, switches, wires, pens, &c., and would be almost unintelligible, but an idea of its extraordinary work may be gained from the following summary of its accomplishments:

A band of plain paper, about twenty inches wide, is fed from a roll into the machine, passing under a complex set of everflowing pens. For every fifty feet of track passed over by the car this paper baud moves one inch, thereby taking eight and a fraction feet for a mile of road. By carefully constructed and adjusted machinery, connected with the wheels of the car, the operator obtains upon the paper a perfect chart of every foot, yes, every inch, of the road. The instrument shows: first, the power required to draw the train; second, a pen marks on the paper the seconds of time in transit; third, another pen marks every tenth second in the same way; fourth, still another pen marks each minute. Then comes a schedule showing the distribution of coal used by the engine; the amount of water used by the engine; a perfect diagram of the track is delineated, showing all curves, grades, &c.; the number of revolutions which the driving wheels of the engine make in a minute or mile, or parts of these two; the location of the mile posts are shown, as also the bridges, the work done by the engine, so given that the foot-pounds of work can be readily ascertained by multiplying the ratios; the velocity and resistance of the wind. All these are plainly and accurately shown upon the diagram. When used to inspect the track, the machine shows the surface of each rail, giving the condition of each joint, &c., and shows at a glance whether the rails are fitted perfectly true, or the least trifle out of place, or if one is a hair's breadth higher than another. The elevation of the rail on a curve is shown and a machine has just been added, which Mr. Dudley invented, giving the exact amount in feet and inches that the rails are depressed from a true line. Another section of the chart gives the exact movements of the engineer when the brakes are applied, when steam is put on, and the power required to start and stop the train. Mr. Dudley examines a road in this way, hands his chart to the superintendent, and that gentleman knows at once just where to make repairs and all other needful particulars. The machine is the invention of Mr. Dudley, he having spent eight years perfecting it, and, save one which he made and sent to Australia, his is the only one in existence.

Besides this workroom there are a nicely furnished library and parlour, containing cabinets and a fine piano, a dining-room, kitchen, bedroom, and storeroom. All this in a common-size passenger coach, and in it Mr. and Mrs. Dudley have lived for the last four years, travelling all over the United States. The lady says the life is a very pleasing one, and she enjoys it much. Both the lady and gentleman are finely educated and entertaining people, and an hour spent in their company is a very profitable one.—*Pittsfield (Mass.) Sun.*

RICHARDSON AND SMITH'S IMPROVEMENTS IN MANUFACTURING PAPER.

THIS invention for making paper consists in the employment of a new vegetable substance combined with other substances now used in the manufacture. Or such vegetable substance can be used alone, to make from it, by the aid of the usual appliances or apparatus, a pulp, from which the paper is made. The vegetable substance used is *Molinea Cærulea*, otherwise *Melica Cærulea*, commonly known as *melic* grass. This grass is converted into pulp or half stuff, and same can, as hereinbefore mentioned, be by the usual appliances or apparatus converted into paper or such substances as may be combined with any of the substances usually employed in the manufacture of paper. The inventors and patentees are Messrs. Richardson and Smith, of Golden-bridge mills, Dublin.

RATTRAY'S LEVER ESCAPEMENTS.

THIS invention consists of a single arm or lever, with an impulse pin or "pallet," and two escape wheels arranged in the following manner:—The lever is mounted on an axle or "staff" in the usual way; the impulse pin, a ruby of a triangular form, is fixed in the arm on either side of the axle at pleasure. The two escape wheels are placed one on each side of the arm, and having the impulse-pin between them, and as nearly as possible in the line of centres. The wheels act on the impulse-pin alternately, it vibrating between them. The motion is given off in the usual manner by the lever. This escapement is equally applicable to watches and clocks. For this lever escapement the following advantages are claimed:—Simplicity of construction, ensuring mathematically-correct manipulation in making, so that the two wheels act with equal power, thereby giving equal impulse to the balance or pendulum. By reason of the direction given to the wheels, the impulse increases in power as the tooth passes along the impulse-pin, a peculiar property of much importance, which will doubtless be recognised by watchmakers. There are no difficult points, and liability to derangement is avoided or minimised. It will make both a better timekeeper and a cheaper watch than heretofore. For a working man's watch or a railway guard's timekeeper, it will be of the greatest service.

The inventor and patentee is Mr. Jas. Rattray, Nethergate, Dundee.

HUGHES' IMPROVED LAMPS.

THIS invention consists in part of improvements upon the Letters Patent granted to Mr. W. Hughes, dated September, 5th, 1877, No. 3386. In the Letters Patent above referred to, the chamber containing the wicks in the lamp is enclosed with a glass of a circular or conical form. These glasses do not allow of sufficient contraction and expansion, and are liable to crack and break. To obviate these objections, in place of the blown annealed glass being circular or conical the inventor cuts or forms this blown annealed glass into parts, which are fitted to or in doors having a spring or other arrangement whereby when the door with the pieces of glass are brought in position against the hood, the glass is fitted tight against same, and thus contraction and expansion is allowed for, and the liability of the glass cracking or breaking is overcome. The glass must be blown and annealed, and in shape so as to fit in the door and against the hood.

For dissolving views he arranges the lamps one above the other on a stand, said stand being so formed as to hold the lamps in position; and between the spaces between the lanterns channels are arranged to allow cool air to pass between the lanterns. The lower lamp or lamps, when arranged in this form, have the chimneys curved to allow the hot air and gas to flow out without coming in contact with the lamp next above.

The cisterns to each lamp for containing the oil when the lamps are arranged for dissolving purposes are arranged outside to keep the contents cool.

The lamps can be arranged single or side-by-side if required for the above purposes.

The inventor is Mr. W. C. Hughes, of 151, Hoxton-street, London.

THE ARMS OF THE OCTOPUS.—The feet or tentacula appended to the head are by no means exclusively destined to effect locomotion; they are used, if required, as agents in seizing prey, and of so terrible a character are they, that, armed with these formidable organs, the "Poulpe" becomes one of the most destructive inhabitants of the sea; for neither superior strength nor activity, nor even defensive armour, is sufficient to save its victims from the ruthless ferocity of such a foe. A hundred and twenty pairs of suckers, more perfect and efficacious than the cupping-glasses of human contrivance, crowd the lower surface of every one of the eight flexible arms. If the Poulpe but touch its prey, it is enough; once a few of these tenacious suckers get firm hold, the swiftness of the fish is unavailing, as it is soon trammelled on all sides by the firmly holding tentacula, and dragged to the mouth of its destroyer. The shell of the lobster or crab is a vain protection, for the hard and crooked beak of the Cephalopod easily breaks to pieces the frail armour.—From *Cassell's Natural History* for April.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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SESSION 1880—1881.

Members' Meetings at 8 p.m. on Thursdays, April 7th and 28th; May 12th and 26th; and June 9th.

Conference on Patent Law, 7th April, 8 p.m.

Annual General Meeting, Thursday, May 26th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

At the Executive Council Meeting held during the past month the important discussion on the Patent Law Question, adjourned from last meeting, was continued, and the matter again adjourned for fuller consideration. At the Members' Meeting several inventions were brought under consideration.

Monthly Notices.

The Late Samuel Courtauld, Esq.—With much regret we have to notify the decease of the above-named gentleman, who for many years occupied the position of Member of Council of the Inventors' Institute. He joined the Institute at its first formation, and took much interest in its proceedings.

The Programme of the Institution of Naval Architects, the meetings of which take place on the 6th, 7th, and 8th of April, is lengthy and varied. There will be no less than sixteen papers on the theory and practice of naval architecture and on marine engineering. There are to be four papers on a subject which is exciting much attention, viz., the use of mild steel in substitution for iron as a material for the construction of the hulls and armour of ships, the shells of steel boilers, and parts of the machinery. Mr. Samuda will deal with the application of steel to the construction of war ships. Mr. W. Parker, chief engineering surveyor to Lloyd's Registry, will treat on the failure of the original steel plates used in the boilers of the Livadia. The best steel has occasionally behaved most treacherously, and Mr. Parker's paper is expected to throw considerable light on this subject. The third paper on steel is by a well-known French authority, M. Berrier Fontaine, who will give an account of the experience of the French dockyards in the use of mild steel for shipbuilding. The fourth paper is by Mr. J. R. Ravenhill, on the increasing use of steel for shipbuilding and marine engineering. Of the papers on theoretical naval architecture, Mr. W. H. White, of the Admiralty, will contribute two. Mr. R. E. Froude will deal with a subject with which his late father's name was identified, viz., the leading phenomena of the wave-making resistance of ships. Finally, Mr. W. John, of Lloyd's Registry, will read a paper on grain cargoes, a matter to which the loss of many grain-laden vessels gives a painful interest.

Mr. F. A. Nobert, the celebrated producer of test-plates for microscopists, is dead. For many years Mr. Nobert has been engaged in ruling micrometers and diffraction plates. It was formerly his opinion that his nineteenth band, which was the 1-10,000th of a Paris line, equal to about 112,000 lines to the English inch, could never be seen resolved in the microscope. Dr. Woodward eventually produced photographs of the finest of these lines, when Mr. Nobert produced a new plate divided into twenty bands, the first ruled at the rate of 1,000 to the Paris line, and the twentieth at the rate of 20,000, or about 224,000 to the English inch.

Admiralty Employés.—"Argus," in the *World*, says: "Admiralty instructions have come down like a steam hammer on what to outsiders seem the legitimate privileges of dockyard or any other workmen. These worthies have been in the habit of committing the enormous mistake of considering their time after regulation hours as their own, and ships' officers and others have occasionally been guilty of the heinous offence of employing them privately during those intervals. But *nous avons changé tout cela*, and in future Government employés are not to work for anyone but Government at any hour of the day or night, on pain of instant and summary dismissal.

M. Sequin.—M. Henri Mathiew, in his recent address to the Paris Société des Ingenieurs Civils, referred to the works of deceased eminent members, and mentioned that M. Marc Sequin as the engineer of the first wire rope suspension bridge which was constructed in 1820 at Tournon, on the Rhone, and said that four hundred bridges on the same principle are now existing. M. Sequin, he also said, was the inventor of the tubular boiler, which he used on a steamboat on the Rhone, and afterwards applied to locomotives in about the year 1827. The brothers Sequin were the concessionaries for the St. Etienne and Lyons Railway, among others, and M. Mathiew referred to them as the founders of the French civil engineering profession. Benoit Fourneyron, the inventor of the Fourneyron turbine, is credited with playing a very important part among the great in the profession.

Sir William Thomson's Mathematical and Physical Papers are being prepared for publication in a separate form. These, with the papers already published, will form a complete series of all the occasional papers which have appeared in various publications up to the present time, and will be printed at the Cambridge University Press.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

APRIL, 1881.

AERIAL LOCOMOTION.

Again the oft attempted effort to give to mankind the advantage of governed travelling above the earth's surface like the birds of the air, is seriously brought before the public, and is now set about as a matter of organized scientific action, for not only have we an Aeronautical Society which has been for some years established, but we have also a Balloon Society of Great Britain. Before the latter body a paper has recently been read which has created some stir in the world. That Colossus of periodic literature, the *Times*, having deigned to consider the subject worthy of elaborate disquisition, and with its usual "knock-me-down" conclusions, makes out the balloon as an aerial machine to be of little worth for aerial locomotion.

But our contemporary is willing to admit that the discussion is most interesting and useful, even if the most promising thing that can be said is that a gallant officer believes he has devised a plan for making a balloon independent of the wind, though he has not yet published it. We really, it is remarked, seem to be arriving at some conclusions of a positive character. It appears to be now agreed that we must be content to be at the best heavy birds, not swallows, or eagles, but geese, and not even wild geese. A goose ready for a gentleman's table would hardly fly over a common garden paling, and if it made the attempt would come plop on the ground, with some chance of injury. An ordinary man is a dozen times the weight of a goose. The conclusion is rather humiliating, but we have better approached the same goal from the opposite direction, for it is now ascertained that a ship is not a fish, as people were led to believe, but a duck. We cannot hope to be ever birds. We must content ourselves with being something between a beast and a bird. The earth must still be our main chance and our resort in time of need. If we could fly for half a mile, that would be something, and then, like the fabled giant, we might acquire strength and impetus every time we touched the soil. Not that the example of the kangaroo is encouraging, for that queer creature does not seem capable of sustaining his bounds long. The advantage of ascertaining our rank in creation—that is, in the supposed evolution of our species in the upward direction—is that we are thereby led to address ourselves to the problem in a businesslike fashion.

The *Times* adds much more in a strain half banter, half serious, which it would serve no useful purpose to reproduce; therefore we will at once refer to the paper itself, which was on "Flight, Natural and Artificial," by Dr. Bell Pettigrew, F.R.S. This was recently read at a meeting of the Balloon Society of Great Britain in the Royal Aquarium, at which Mr. W. H. Le Fevre, C.E., President of the society, took the chair. Reviewing the principal structural differences of the bodies and limbs by which animals were fitted to move on land, through water, or in air, Dr. Pettigrew pointed out that the analogy which obtained between water and the air as supporting media had strangely and gravely complicated the problem of flight, the idea uppermost in most minds being that a flying creature must float upon the air as a ship floats upon the water. It was this idea that led to the discovery of the balloon, though the balloon could not in any sense at present be regarded as a flying machine. Until endowed with the means of moving from one place to another independently of the wind, as he hoped it would soon be by the ingenuity of a member of the society, a gallant officer, whose plan had not yet been made public, the balloon would remain merely a lifting apparatus. The balloon was inefficient because of its levity; the flying creature was efficient because of its weight. The manner in which wings produced what was practically a solid basis of support in the thin air raised the whole subject of flight. After describing minutely the structure and action of natural wings, he said, with regard to the speed at which they were driven, that the common housefly moved its wings 330 times per second, or 19,800 times per minute, the butterfly managing only nine movements per second, or 540 per minute. That the wing was driven more slowly in proportion to its length had been proved by experiment, and this fact was hope for the future of flying machines, as there could be no doubt that comparative slow movements would suffice for driving the long powerful wings required to elevate and propel flying machines. It was evident from what was seen in nature that flight was to a large extent a question of weight and power of body and size and speed of wing. It was satisfactory to find that a solution of the difficult and important problem of artificial flight was being attempted by men of the highest scientific attainments, and that aeronautical societies had of late years been established in France, Austria, and this and other countries. Classifying the various machines by which aerial locomotion had been attempted, he pointed out the causes of failure and the means by which partial success had in some cases been obtained. One of the main difficulties in the way of constructors of machines for aerial transit was the want of sufficiently powerful and light motor, and in the use of compressed air for this purpose he saw a probable means of doing without the heavy steam or electric engine. Aerial navigation might well appear Utopian to the mass of mankind. It was not, however, on that account impossible. It was a question of time, perseverance, and ingenuity, simply a very complex physical problem, and the *dat* for its solution were being slowly but surely accumulated. A discussion on this paper followed, in which Mr. Thomas Moy and Mr. Douglas Scoffern took part.

Proceedings of Societies.

ROYAL SOCIETY.

FEB. 24.—The President in the chair.—The following papers were read: "On a Simple Mode of eliminating Errors of Adjustment in Delicate Observations of Compared Spectra," by Prof. Stokes,—"Notes on Physical Geology, No. VII.": On the Secular Inequalities in Terrestrial Climates depending on the Perihelion, Longitude, and Eccentricity of the Earth's Orbit," by the Rev. Dr. Houghton,—and "Further Experiments on the Action of an Intermittent Beam of Radiant Heat on Gaseous Matter: Thermometric Measurements," by Dr. Tyndall.

MARCH 10.—The President in the chair.—The following papers were read. "On the Conversion of Radiant Energy into Sonorous Vibrations," by Mr. W. H. Preece,—"On the Limit of the Liquid State," by Mr. J. B. Hannay,—and "On the Diastase of Koji," by Prof. R. W. Atkinson.

MARCH 17.—The President in the chair.—The following papers were read: "On the Electrical Resistance of thin Liquid Films, with a Revision of Newton's Table of Colours," by Profs. Reinold and Rucker.—"Molecular Electromagnetic Induction," by Prof. Hughes.—and "On the Action of Sodium upon Chinoline," by Mr. C. G. Williams.

GEOLOGICAL SOCIETY.

FEB. 18.—*Annual Meeting.*—R. Etheridge, Esq., President, in the chair.—The Secretaries read the reports of the Council and of the Library and Museum Committee for the year 1880.—The President presented the Wollaston Gold Medal to Prof. P. M. Duncan; the Murchison Medal to Prof. A. Geikie; the Lyell Medal to Mr. W. W. Smyth, for transmission to Dr. J. W. Dawson, of Montreal; the Bigsby Medal to Prof. Morris, for transmission to Dr. C. Barrois; to Prof. J. W. Judd, the balance of the Wollaston Donation Fund, for transmission to Dr. R. H. Traquair; the balance of the proceeds of the Murchison Donation Fund to Mr. F. Rutley; to Mr. G. R. Vine one moiety of the balance of the proceeds of the Lyell Donation Fund; and to Prof. H. G. Seeley, for transmission to Dr. A. Fritsch, of Prague, the second moiety of the Lyell Donation Fund.—The President then read his anniversary address.—The following gentlemen wese elected the Council and Officers for the ensuing year: President, R. Etheridge; Vice-Presidents, Dr. J. Evans, J. W. Hulke, Prof. J. Morris, and Dr. H. C. Sorby; Secretaries, Prof. T. G. Bonney and Prof. J. W: Judd; Foreign Secretary, W. W. Smyth; Treasurer, Dr. J. Gwyn Jeffreys; Council, H. Bauerman, Rev. J. F. Blake, Prof. T. G. Bonney, W. Carruthers, Prof. P. M. Duncan, Sir P. de M. Grey-Egerton, Bart., R. Etheridge, Dr. J. Evans, Lieut-Col. H. H. Godwin-Austen, J. C. Hawkshaw, Rev. E. Hill, W. H. Hudlestone, J. W. Hulke, Dr. J. Gwyn Jeffreys, Prof. J. W. Judd, Prof. N. S. Maskelyne, J. Morris, J. A. Phillips, F. W. Rudler, Prof. H. G. Seeley, W. W. Smyth, Dr. H. C. Sorby, and Dr. H. Woodward.

FEB. 23.—R. Etheridge, Esq., President, in the chair.—Mr. W. H. Goss was elected a Fellow.—The following communications were read: A letter from Dr. John Kirk, communicated to the Society by the Right Hon. Earl Granville, dated H.M. Agency and Consulate General. Zanzibar, Dec. 20th 1880.—"On the Permian, Triassic, and Liassic Rocks of the Carlisle Basin," by Mr. T. V. Holmes,—and "On *Astroconia Granti*. a new Lyssakine Hexactinellid from the Silurian Formation of Canada," by Prof. W. J. Sollas.

MARCH 9.—R. Etheridge, Esq., President, in the chair.—Messrs. R. T. Burnett, W. E. Darwin, C. J. Fox, and the Rev. T. G. Hutt were elected Fellows.—The following communications were read: "Description of Parts of the Skeleton of an Anomodont Reptile (*Platypodosarus robustus*, Ow.), Part II. The Pelvis," "On the Order Theriodontia, with a Description of a New Genus and Species (*Ælurosaurus felinus*, Ow.), by Prof. Owen,—and "Additional Observations on the Superficial Geology of British Columbia and its Adjacent Regions," by Mr. G. M. Dawson.

SOCIETY OF ANTIQUARIES.

FEB. 24.—E. Freshfield, Esq., V.P., in the chair.—A communication was read from Mr. C. E. Davies, appealing to the Society for a grant in aid of the expense of arching over the large Roman bath which, together with other remains of great interest, had been exposed to view during recent works for perfecting the drainage of the baths. These works were described by Mr. Davis in a paper laid before the Society last session, when a resolution was passed to urge the Mayor and Corporation to take steps to keep the large bath exposed to view. A resoluiion to the same effect was passed this evening, the question of a grant in aid being reserved for the consideration of the Council. Mr. J. T. Micklethwaite read an elaborate paper "On the Imagery of Henry VII.'s Chapel," a collection of statuary the like of which exists nowhere else in England. This is the first time they have been critically examined and accurately identified. The figures are evidently the work of many hands, and vary in quality from very good to very bad. The smaller ones, in the body of the chapel, are about 3 ft. 3 in. high; the larger ones, in the aisles and side chapels, are about 5 ft. These large ones are probably the earliest and are certainly the best. Of the hundred and seven stone images which once adorned the interior of the chapel, not less than ninety-five still remain; and of the twelve missing ones, Mr. Micklethwaite was able to identify the subjects of some and to explain the absence of all. The groups in the small chapels are complete in themselves, and probably had some reference to the altsrs which once stood there. The upper range was intended, as Mr. Micklethwaite believed, to set forth the whole company of the saints assembled round our Lord enthroned, and the chief of those who are found below ere repeated there. Mr. Micklethwaite handed round among the Fellows present a diagram of the chapel, giving a synoptical view of the names he assigned (wherever it was possible to do so) to the various statues remaining, and on the walls of the room he exhibited, in further illustration of his paper, a series of drawings of the principal statues executed by Mr. Wetherley.

MARCH 10.—E. Freshfield, Esq., V.P., in the chair.—Mr. J. T. Widger exhibited a flint implement found in the caves at Torbryan, towards the excavation of which the Society had last year given a grant.—The Rev. J. Lloyd exhibited a very beautiful MS. of the Vulgate, date late thirteenth century.—Mr. J. Brown, jen, exhibited a curious German astronomico-astrological manuscript of the fifteenth century, the production of some German artist of the Augsburg school. It was copiously illustrated with astronomical and astrological pictures, signs of the zodiac, &c.; and in connection with these Mr. Brown laid before the Society some speculations on the origin of the zodiacal signs, which he endeavoured to trace back to the names given by the Akkadai or Highland and pre-Semitic inhabitants of the Uprato or Euphrates Valley to the several months of the year. Mr. Brown entered into full details on this subject, on the authority of Prof. Sayce and Mr. F. Lenormant.—Mr. Pinches, of the British Museum, was present, and expressed doubts whether the evidence as to the meaning of the Assyrian tablets referred to was sufficiently complete to bear the weight of the theory advanced by Mr. Brown and by the two distinguished Assyriologists to whom he had referred.

ROYAL SOCIETY OF LITERATURE.

FEB. 23.—Sir P. de Colquhoun, Q.C., in the chair.—Mr. W. A. Barrett read a paper "On the Fathers of English Church Music," in which he showed that Gregory of Bridlington, Adam of Dore Abbey, in Herefordshire, Walter Odington of Evesham, John of Salisbury, and Thomas de Walsingham were ample evidence of English musicians in very early times. The systems of notation employed in the mediæval periods, with obscure and vague definitions, rendering translatien into modern notation unsatisfactory if not misleading, were touched on; and the peculiarities of "organon, diaphony, and descant" were noticed briefly, as an introduction to the more definite matters of musical history. Mr. Barrett held that the history of church music in England began in the latter part of the fifteenth century, with John of Dunstable's invention or employment of counterpoint, contributions to this art having been doubtless supplied by Dr. Robert Fairfax, John Sheppard, and John Taverner, contemporary musicians. The claims of John Redford, of St. Paul's, and of John Marbeck, of Windsor, were duly acknowledged, as were also the labours of Thomas Tallis and William Birde, who, by the aid of the "printing patents" granted to them, were able widely to extend the musical developments due to their genius.

INSTITUTION OF CIVIL ENGINEERS.

MARCH 1.—Mr. J. Abernethy, President in the chair.—It was announced that the Council had recently transferred Messrs. C. J. Bowstead and W. Hall to the class of Members, and had admitted sixteen gentlemen as Students.—The monthly ballot resulted in the election of eight Members, eighteen Associate Members, and two Associates.—The paper read was "On the Tide Gauge, Tidal Harmonic Analyzer, and Tide Predicter," by Sir W. Thomson.

MARCH 22.—Mr. Abernethy, President, in the chair.—The paper read was "On the Comparative Endurance of Iron and Mild Steel when exposed to Corrosive influences," by Mr. D. Phillips.

PHYSICAL SOCIETY.

FEB. 26.—Prof. Fuller in the chair.—The meeting was at first a special one, and adopted the resolution brought before the last meeting anent the investment of the Society's money. After this it became an ordinary meeting, and Dr. O. J. Lodge showed two hydro-mechanical analogies by electricity.—Mr. C. V. Boys exhibited an integrating machine illustrating the mathematical process.—Mr. S. Bidwell described his apparatus for transmitting pictures to a distance by means of selenium and the electric current. This is an application of the selenium cell of Prof. Bell to Mr. Bakewell's copying telegraph, whereby the receiving style is made to mark parallel lines on a sheet of Bain's chemical telegraph paper, except when the transmitting current is neutralized by the luminous image of an object falling on the selenium cell at the transmitting end.—Profs. Ayrton and Perry showed a device for sending chiaroscuro images by electricity.

ASIATIC SOCIETY.

FEB. 21.—Sir H. C. Rawlinson, President, in the chair.—Mr. W. Bramsen was elected a Resident Member; Rev. R. Wade and Lieut. A. F. Barrow were elected Non-resident Members.—The Rev. J. Cain read a paper "On the Kois or Gonds of Central India," in which he pointed out that this tribe is now divided into eight castes, the Gomma Kois, the descendants of those who formerly resided on the uplands of the Bastar plateau, being the most numerous. Each group of villages is presided over by a head man, whose business is to settle tribal disputes, and to inflict fines for the breach of caste rules. The people are generally timid, inoffensive, and truthful, but have not improved morally by contact with their Hindu neighbours. Aa a rule, they hold the Pandava family in great veneration, Bhima and Arjuna being their chief gods; at the same time they also recognise certain secondary deities, and have a vague belief in a future state of the soul. The corpses of adults are burned, the ashes of the corpse being often collected and placed under large slabs of stone. Bird-catching is also a common custom with them. Their language is Dravidian, with many resemblances to Tamil and Telugu.—Mr. C. Graham gave an account of "The Lesghian or Avar Language," which still survives along the highest peaks of Daghistan, on the east side of the Caucasus, the speakers of it, under their famous chief Shamil, having been the last to submit to the arms of Russia, and their present population numbering about 150,000. In 1873 Mr. Graham travelled through this district, and was much aided in his researches by Prince Melikoff, then Commander-in-Chief. At Gunib he met with a highly cultivated Munshi, who called his attention to the Avar language, one notable feature of which is the "click" which may be heard at the beginning, middle, or end of certain works. At Tiflis he made the acquaintance of M. Adolphe Berger, who placed in his hands the manuscript (the result of many years' patient research) which, having been translated by Mr. Graham from the original Russ, forms the basis of his paper.

SOCIETY OF ARTS.

FEB. 23.—The Hon. C. W. Fitzwilliam, M.P., in the chair.—A paper "On Rivers Conservancy" was read by Mr. C. N. Cresswell.—A discussion followed, in which Sir F. Nicholson, Bart., Mr. G. J. Symons, and others took part.

FEB. 24.—Capt. Sir G. Nares in the chair. —A paper "On Deep-Sea Investigation and the Apparatus used in It" was read before the Section of Applied Chemistry and Physics by Mr. J. Y. Buchanan.

FEB. 25.—W. H. Hall, Esq., in the chair. —The adjourned discussion on Mr. S. Taylor's paper, "The Participation of Labour in the Profit of Enterprise," was resumed.

MARCH 1.—Sir H. Berkeley in the chair.— A paper "On the Languages of Africa" was read before the Foreign and Colonial Section by Mr. R. N. Cust.

MARCH 2.—F. J. BRAMWELL, Esq., in the chair.—A paper "On Lighthouse Characteristics" was read by Sir W. Thomson. The paper dealt, among other subjects, with the proposal of Sir W. Thomson that all lighthouses, by means of flashing signals similar to the Morse code, should signal their own names.

MARCH 14.—Dr. Mann in the chair.—The second of the present course of Cantor Lectures, "On the Scientific Principles involved in Electric Lighting," was delivered by Prof. W. S. Adams.

MARCH 15.—H. Escombe, Esq., in the chair.—A paper "On the Diamond Fields of South Africa," was read by Mr. R. W. Murray before the Foreign and Colonial Section of the Society.

MARCH 16.—Lord A. Churchill in the chair.—Col. Beaumont read a paper describing his compressed air locomotive and its application for tramway and locomotive purposes generally.

MARCH 21.—W. H. Preece, Esq., in the chair.—The third of his course of Cantor Lectures, "On the Scientific Principles involved in Electric Lighting, was delivered by Prof. W. G. Adams.

MARCH 23.—Prof. Abel in the chair.—A paper "On the Increasing Number of Deaths from Explosions, with an Examination of the Causes," was read by Mr. C. Walford.

CHEMICAL SOCIETY.

MARCH 17.—Prof. Roscoe, President, in the chair.—The following papers were read: "On the Volume of Mixed Liquids," by Mr. F. D. Brown.—"On the Action of Alcohol on Mercuric Nitrate," by Mr. R. Cowper. When mercury is dissolved in twelve times its weight of nitric acid (1·3), the solution allowed to stand until all nitrous fumes have escaped, and twelve parts by weight of pure alcohol added, a crystalline precipitate is formed, with or without heating, which the author has investigated; it has the constitution $(C_2H_2Hg_3O_2)(NO_2)_2$. He has also prepared the hydrate and oxalate of the dyadradical $(C_2H_2Hg_3O_2)$,—"On Boron Hydride," by Messrs. F. Jones and R. L. Taylor.—"On the Action of Aldehydes on Phenanthraquinone in presence of Ammonia," by Dr. F. R. Japp and Mr. E. Wilcock.—"On the Action of Benzoic Acid on Naphthaquinone," by Dr. F. R, Japp and Mr. N. H. J. Miller.—"Note on the Appearance of Nitrous Acid during the Evaporation of Water," by Mr. R. Warington. The author proves that the nitrous acid is always derived from the atmosphere or from the products of combustion, from the source of heat used for evaporating; he also gave some account of the marvellously delicate test proposed by Griess for nitrous acid. The solution is acidified, and some sulphanilic acid with some hydrochlorate of naphthylamin added; if nitrous acid be present, equal to one part of nitrogen in 1,000,000,000 of water, a rose red tint is developed.—"On the Sweet Principle of *Smilax glycophylla*," by Dr. Wright and Mr. Rennie.—"Note on Usnic Acid and some Products of its Decomposition," by the late Dr. J. Stenhouse and Mr. C. E. Groves.— "On the Absorption of Solar Rays by Atmospheric Ozone, and on the Blue Tint of the Atmosphere," by Mr. W. N. Hartley. The author concludes that the higher regions of the atmosphere contain much more ozone than the layers near the earth's surface, and that the blue tint of the atmosphere is largely due to ozone,—"On the Nature of certain Volatile Products contained in crude Coal-tar Benzenes," by Mr. W. Smith.—"On New Zealand Kauri Gum," by Mr. E. H. Rennie.

METEOROLOGICAL SOCIETY.

MARCH 16.—G. J. Symons, Esq., President, in the chair,—Rev. A. J. C. Allen, Rev. E. W. Ford, Messrs. B. Chapman, G. T. Gwilliam, H. B. Jupp, A. Ramsay, and J. Stokes were elected Fellows.—The President gave an historical sketch of various classes of hygrometers, and described about 120 different patterns, after which an exhibition of instruments was held showing various kinds of hygrometers, and also some instruments which have been brought out since January 1st, 1880.

ASTRONOMICAL SOCIETY.

MARCH 11.—J. R. Hind, President, in the chair.—Mr. S. T. S. Lecky, Mr. J. H. Mitchiner, and the Rev. T. R. Terry were elected Fellows.—The Astronomer-Royal read a paper on the effects produced on the moon's movements in latitude by the slow change of the position of the plane of the ecliptic. The action of the planets gives rise to a small change in the plane of the earth's orbit, causing it to move through an angle of rather less than half a second in a year, so that the plane of the new orbit intersects the plane of the old orbit in a line whose longitude is about 172°. This will evidently produce no sensible change in the moon's longitude; and the Astronomer-Royal showed in his paper that, owing to the motion of the earth and the consequent alteration in the sun's place, it produces no sensible effect on the moon's latitude, so that the position of the moon as referred to the disturbed orbit is the same as it would be if referred to a fixed plane—in fact, that the movable ecliptic may be considered to carry the moon's orbit along with it. The question had been already considered by La Place, but the Astronomer-Royal had carried the approximations a step further.—Mr. Neison read a paper, written by himself jointly with Mr. Campbell, on the determination of the value of the parallactic inequality in the motion of the moon. He stated that in their investigation they had relied solely on observations made with the transit instrument, as they believed that systematic errors were introduced in observations made with the altazimuth instrument, due to differences of refraction in different azimuths and to the different diameters of the moon made use of.—In the discussion which followed Mr. Stone and Mr. Christie stated that they thought that the different conditions under which the altazimuth observations were made would rather tend to get rid of systematic errors than to produce them.—Mr. Knobel read a note on the comparative brightness of the nebula in Orion as measured with an astrometer. His observations tended to show that a part of the nebula a little preceeding the trapezium, which was shown as the densest region in Dr. Draper's photograph, was also the brightest region as viewed with the eye.—Mr. Ranayrd mentioned that he had received a letter from Dr. Draper stating that his original negative showed faint parts of the nebula corresponding to a much larger area than was shown on the enlarged copy of the photograph exhibited at the January meeting of the Society.—The President remarked that last Sunday evening, the 13th of March, was the centenary of the discovery of the planet Uranus by Sir W. Herschel. He also mentioned that, in accordance with the resolution passed at the general meeting, the Council had appointed Friday evening, the 1st of April, at eight o'clock, for the meeting convened by the Society to consider the question of endowment of research by the Government.

PHOTOGRAPHIC SOCIETY.

MARCH 8.—J. Glaisher, Esq., President, in the chair.—The following papers were read: "On Art Photography," by Mr. P. Jennings. The deficiencies of photographic art were alluded to, and the necessity of attention to art rules insisted on.—"Notes on Photography and Art," by Mr. E. Cocking. The essential difference between the art of the painter and that of the photographer was clearly defined, also the different training required by each was pointed out, and an assertion made that an organized school for art-photograph yhad become a positive necessity.

ANTHROPOLOGICAL INSTITUTE.

FEB.—F. W. Rudler, Esq., V.P., in the chair.—The election of Mr. E. R. Robinson was announced.—A paper "On Arrow-Poisons prepared by some North American Indians," by Mr. W. J. Hoffman, was read. The information was obtained from Indian chiefs who visited Washington in 1880, and the tribes alluded to in the paper were the Shoshoni and Banak, Pai-Ute, Comanche, Lipan Apache, and Sisseton Dakota. This last tribe have a method of poisoning bullets by drilling four small holes at equal distances around the horizontal circumference, and filling the cavities with the cuticle scraped from the branch of cactus (*Opuntia Missouriense*); the projecting rim of metal caused by the drilling is then pressed over the scrapings, to prevent their being rubbed off or lost. As the opuntia is a harmless plant, the idea of poison is evidently suggested by the pain experienced when carelessly handling the plant, which is covered with barbed spines.—A paper was read by Dr. D. Christison "On the Gauchos of San Jorge, Central Uruguay."

March 8.—F. W. Rudler, Esq., V.P., in the chair.—The election of Dr. G. D. Thane was announced.—A collection of rubbings taken from door-posts and window-frames in New Zealand was exhibited. They were chiefly interesting from the proof which they afforded of the clear influence of matted and woven materials on the ornamentation of stone architecture, a parallel to the influence of wood architecture on stone architecture pointed out by Fellowes in Lycia and by Lepsius in Egypt; also from the remarkable coincidence between some of these ornamentations and the outlines on the tombstones of Mycenæ—a near approach to the triglyph in New Zealand.—A short note by Mr. S, E. Peal on Assam pile-dwellings was read, and illustrated by a series of sketches by the author.—Lieut.-Col. R. G. Woodthorpe read a paper on the wild tribes inhabiting the so-called Naga Hills on our north-eastern frontier of India. The paper dealt only with the Angami Nagas, who it was stated, differ from all the other hill tribes of Assam in many important particulars, such as appearance, architecture, mode of cultivation, language, and dress. In appearance they are finer, cleaner, and better-looking race; they build their houses resting on the ground, and not raised on piles, as all the other hill tribes of Assam (except the Khasias) do, and after a pattern not seen elsewhere. In dress the Angami differs most strikingly from all the others tribes in the kilt or short petticoat of dark cloth, ornamented with rows of white cowrie shells, the waistcloth of all other Nagas consisting only of a flap of cloth in front and behind, and often only in front. The Angamis erect tall monoliths in commemoration of the dead or of some social event. These monoliths, often of great size, are dragged up hill on sledges running on rollers.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

March 16.—The Rev. S. M. Mayhew in the chair.—Mr. R. Blair exhibited sketches of a Saxon tombstone at Monkswearmouth, found in the repair of the church, and now preserved in the vestry.—Mr. Cuthbert Bede described an early bronze stopper recently found in Rutland, and Mr. Saunders a copper coin of Byzantine date, taken from the city wall of Hereford.—Mr. H. Fisher produced a bronze bell of German work.—Mr. Chasemore described the discovery of flint flakes on the banks of the Thames at Putney, and Mr. W. Smith exhibited several others from the northern heights of London, from positions fully sixty feet above the present level of the Thames. Among these was a pounder of grey granite found in a bed of sand fifteen feet thick at Shacklewell.—Mr. R. Smith sent sketches of some rare pilgrim signs, derived from a continental source.—Mr. Ferguson produced a large collection of knitting-sheaths from the Wigton district, Cumberland. These archaic-looking instruments were much commented on, and the Chairman pointed out the resemblance of some to the form of the knife on the Mithraic sculpture at Newcastle, while Mr. G. Wright drew attention to their analogy to the Persian creases.—Mr. L. Brock described various fictile articles recently found in London.—The Chairman exhibited a series of Venetian and other glass vessels.—The first paper was on the discovery of two Roman pottery kilns on West Stow Heath, Suffolk, by the finder, Mr. H. Prigg. These are circular and small. The wares made were of light and dark pottery, and included a patera with a potter's mark of fine dark ware, similar to Samian except in colour.—The second paper was by Dr. Steven's, of Reading, and was descriptive of some curious discoveries made while excavating in the river Kenneth at that town for a new bridge. Mediæval relics were met with, beneath these others of Roman date, while at the lowest level reached were many bones of prehistoric and extinct animals, with knitting implements of very remote age.

MICROSCOPICAL SOCIETY.

March 9.—Prof. P. M. Duncan, President, in the chair.—Messrs. Swift and Sons' new working microscope and fine adjustment and the Griffith Club portable microscope were exhibited.—Mr. Powell showed *Amphipleura pellicida* with the vertical illuminator, and Mr. Stephenson pointed out that the illumination was not opaque, as supposed, but that the diatom was illuminated by transmitted light, reflected back by its own under surface.—Mr. Crisp exhibited Prof. Abbe's radiation apparatus for showing the increased amount of light emitted by a radiant in glass or balsam compared to one in air.—Mr. A. D. Michael read a paper on a supposed new species of Acarus, *Dermaleichus heteropus*; and Dr. E. Cutter's paper on a supposed infusorian in the nasal passage in cases of catarrh was explained by Mr. Stewart and commented on by the President.—Discussions also took place on carbolic acid for mounting and on the Society standard screw.

FOLK-LORE SOCIETY.

March 11.—Dr. R. Brown in the chair.—The Honorary Secretary read a paper "On Madagascar Folk-lore," by the Rev. J. Sibree, jun.—A paper by the Rev. H. Friend, "On Euphemism and Tabu in China," was also received.—After the disposal of the papers, Mr. Gomme asked the opinion of the meeting on a probable explanation of some incidents in the story of "The Three Noodles" by means of reference to facts in modern savage life and manners, and Mr. A. Nutt, Mr. A. Lang, and others took part in the discussion.

Electric Notes.—The *Electrician* has the following:—"It is reported that the interior of Windsor Castle is shortly to be illuminated by the electric light. M. Ader has just been awarded 3,000 francs by the Paris Academy of Sciences for his advances in phonetic telegraphy, as also telephony. Efforts are being made to establish telephonic communication between the Houses of Parliament and the clubs and private houses of members. The cost, if carried out, will be £15 per annum for half a mile, £19 for a mile, and £4 for each additional half-mile. Rouen is to be illuminated, and tenders have been received from Messrs. Siemens and a local firm. The project will include the establishment of a motor of 500-horse power, capable of supplying 1,200 lamps, of 50 Carcel burner power each. The light will be distributed among subscribers, who will be enabled to turn their own lights off and on at will. The underground wires being laid between Paris and Nancy are placed in an iron tube, accessible by means of doors at every 500 mètres distance. In this way the necessity for breaking up the ground to get at the wires is obviated. The working of this system will be of interest to telegraph engineers on this side the channel, particularly now that the question of overhead v. underground wires is so prominent.

Tracing the Pendulum.—At the last session of the American Association, Professor Mayer said: "Last year, in the month of October, I mounted in the physical laboratory of the Stevens Institute of Technology a Foucalt pendulum, formed of a cannon ball, suspended by a steel wire. By floating the ball in mercury, I determined the point on the ball to which the wire should be attached, so that this point and the centre of gravity of the ball should be in the same vertical line. This line, having been prolonged as a diameter of the ball, determined the spot into which I screwed a pointed index. The point of this index, when the ball was stationary, was about 1-40 of an inch above a piece of smoked paper, placed on a plate of metal which had been carefully brought into a horizontal plane. The pendulum was now drawn from the vertical by the tension of a delicate cord, one end of which was attached to the ball, the other fastened to a fixed support. The pendulum was started, in the usual manner, by burning this string. After a few oscillations a current of electric sparks from an induction coil was passed through the suspending wire, and from the point of index of the pendulum through the smoked paper to the metal plate, and thus was obtained a trace of the path of oscillation of the pendulum. At successive and known intervals of time I obtained similar traces, which were rendered permanent by passing the smoked paper through spirit varnish. Last May I described this experiment to Professor Cross, of the Massachusetts Institute of Technology, and he then informed me that the same idea had occurred to him, though he had not put it in practice, and also that he had recently mentioned this plan of experimenting before the American Academy of Arts and Sciences in Boston; therefore his name and mine should be always associated in designating this method of obtaining a permanent trace from the Foucalt pendulum.

Roberts's Tide Predictor.—Mr. Roberts, of the "Nautical Almanac" Office, is authorised by resolution of Council of the Secretary of State for India, dated August 7, 1880, to make it generally known that his tide predictor may be employed for the preparation of tide cables (subject to the payment of a nominal fee to the India Office for the use of the machine) for any port for which the requisite *data* are forthcoming on application to him. The tide predictor has already been used for the preparation of the tide tables for 1880 for the ports of Bombay and Kurrachee (published by authority of the Secretary of State for India in Council) with the most satisfactory results. It has also been used for the tide tables for 1881 for Indian ports, which include, in addition to those of Bombay and Kurrachee, the tides also for Aden, Okha Point, and Beyt Harbour (Gulf of Cutch), Karwar, Beypore, the Paumben Pass, and Vizagapatam. The tide tables for 1882, the preparation of which is already far advanced, will include, in addition to the above eight ports, the following seven—viz., Madras, Rangoon, Moulmein, Port Blair, and, on the Hooghly River, Fort Gloster, Diamond Harbour, and Kidderpore (Calcutta). It is anticipated that, in addition to a still further number of Indian ports to be predicted for 1883, Mr. Roberts will have the preparation of tide tables for Table Bay, Port Elizabeth, East London, and Durban, tidal observations at these places being now in progress, or shortly to be commenced for this purpose. The observations, when a sufficient series has been taken, will be placed in the hands of Mr. Roberts for the determination of the requisite *data* for the predictions—*Nature.*

Paris International Exhibition of Electricity.—We are asked to make known that at the request of the Commissaire Général, the "Society of Telegraph Engineers, and of Electricians" have undertaken to supply to and collect from intending British Exhibitors application for space at the forthcoming Exhibition. Forms of application and copies of the general rule, can be obtained at the Offices of the Society, 4, Broad Sanctuary, Westminster, London, by letter addressed to the Secretary of the Society, or by personal application between the hours of 11 and 5.

TELEGRAPHIC PHOTOGRAPHY.

A GOOD deal of interest has been excited lately by the proposals which have been made for the transmission of pictures by telegraph. At a recent meeting of the Physical Society two pieces of apparatus were shown by which pictures of a rudimentary sort were actually sent along a short length of wire and reproduced at its opposite end. These two are quite distinct in idea and construction; one was by Mr. Shelford Bidwell, and the other was the joint invention of Messrs. Ayrton and Perry. Mr. Bidwell's machine was again recently exhibited at the Royal Institution, and an improved form of Messrs. Ayrton and Perry's apparatus has also been shown recently elsewhere in London.

The power which an electric current possesses of decomposing certain chemical solutions has been turned to account in various telegraphic instruments, notably in Bain's chemical telegraph and in Bakewell's copying telegraph. A paper moistened with this solution is laid on a metal plate, to which the wire from one pole of a battery is joined. The other pole of the battery is connected to a metal style. As soon as the style touches the paper the current passes, the solution is decomposed, and the paper is marked. If the style is moved over the paper, a line is drawn, and if the paper is drawn along under the style the same result is obtained. But the marks are only made while the current is passing, and as soon as the current is interrupted the line is interrupted too. Thus there may be produced a broken line of dots and dashes corresponding with any series of brakes in the electric current. If the style be moved across and across the paper in parallel straight lines, the breaks may be arranged to form any desired pattern. Evidently the same effect may be produced if the style traces a course round and round a cylinder instead of across a flat plate; and this is actually the method usually employed. In previous telegraphic instruments various devices were employed for controlling the electric current at the sending station, but it occurred to Mr. Bidwell that this might be done by the action of light itself on selenium, the curious metal the properties of which have been made familiar to the public by Professor Bell's photophone. Selenium, it will be remembered under certain conditions, allows electricity to pass through it more freely in the light than in the dark. A properly constructed "cell" of selenium, forming part of an electric circuit, will vary the strength of the current precisely in accordance with the amount of light falling on it. If, now, we imagine a photographic image focused on a selenium cell, and such an arrangement made that the selenium can "see" only a minute portion of the picture at a time, then, if it is moved over the picture in straight lines, so as to receive the lights and shadows of it in succession, it might conceivably regulate an electro-chemical drawing arrangement such as that above described, provided, of course, that the style of the drawing apparatus and the selenium receiver moved inabsolute correspondence. On this principle Mr. Bidwell has actually made a piece of apparatus by which he can transmit rough outlines of very simple figures—square or diamond-shaped holes, for instance, cut in pieces of zinc. In this experimental apparatus, the great difficulty of insuring absolute synchronism between the two parts of the apparatus is evaded by the simple plan of driving both by one handle, but this device is hardly applicable when the sending and receiving stations are more than a few inches apart.

The apparatus for the same purpose proposed by Messrs. Ayrton and Perry consists of a mosaic" of selenium cells, each cell in telegraphic communication with one of a corresponding number of devices, by which a small mirror is adjusted to throw a more or less light on a screen. They thus hope to produce a pattern in light and shade corresponding with the amounts of light and shade thrown on the selenium cells by a picture thrown on them.

THE SPHEROIDAL STATE OF WATER AND BOILER EXPLOSIONS.

MR. J. W. KENYON read a paper recently before the Manchester Association of Employers, Foremen, and Draughtsmen, in which he observed that if a drop of water be thrown on to a smooth plate exposed to the action of heat, the water is found to evaporate as the heat increases up to a temperature of about 150 degrees, when the drop assumes the spheroidal form and rolls about on its axis. Whilst in this condition it evaporates more slowly than when the plate was at a lower temperature, owing to there being a film of steam between the globule and the plate, which prevents its contact therewith, and thus the heat is only transmitted by conduction. There is, so to speak, below the drop an incessant development of vapour which escapes laterally. If the temperature is lowered, the development of the vapour ceases, contact with plate is restored, and the spheroidal condition ceases also. When water is being converted by heat into steam—that is, when the temperature has been increased up to boiling point—globules of steam are evolved. The phenomena of ebullition or boiling are curious, and vary considerably according to different conditions. For instance, if we take an ordinary chemist's beaker and apply heat to the bottom, when the temperature arrives at 150 degrees small globules formed of particles of water containing elastic vapour begin to ascend to the surface. If the heat is continued, the particles of water in contact with the heated surface continue to ascend in globular form. When the temperature arrives at 212 degrees, Fahrenheit the steam is evolved so rapidly that the globules have to struggle through the water, and in so doing toss the liquid about, producing the phenomena of ebullition. The globules disappear at the surface, filling the upper part with steam if it is an enclosed vessel, and, if open, topped with vapour. If not impeded in their course, the globules will rise in vertical lines, and their size varies in accordance with the intensity of the heat and the rate in which this is transmitted. If the water is pure, and on evaporation contains no sediment, and the vessel in which steam is being generated contains an increasing area, as in the case of an ordinary pan, the globules will get away freely; and even with a brisk fire, in their rapid transmission, would not cause such a commotion in the water as to materially disturb it. But if anything of a flour-like character is added, so as to thicken the water, the result will be very different, because the globules formed on the bottom and sides of the vessel cannot struggle through the thick water as quickly as the heat is transmitted; they increase in size, and form a film of steam under the water, thereby lifting or vomiting it from the heating surface. The slightest admixture of grease would aggravate these conditions. In the case of a steam boiler, the conditions above described would be likely to cause expense and annoyance, if not actual explosion. Boiler explosions are often erroneously ascribed to water in the boiler assuming the spheroidal state, and the sudden development of steam consequent on water being injected on to red-hot plates. The danger of injecting water on hot plates, he thought, had been greatly exaggerated, and as the subject was of great general importance, having reference not only to the explosion of steam boilers, but also to kitchen boilers, the results of some experiments conducted on the premises of Messrs. Storey and Son, of Manchester, would not be uninteresting. Mr. Kenyon then proceeded to read extracts from the report of three circulating boiler tests made by the chief engineer of the Manchester Steam Users' Association, all of which pointed to the conclusion that the idea of explosions arising from the instantaneous generation of a large amount of steam through the injection of water on to red-hot plates was a fallacy, and that the bursting of circulating boilers during frost was due simply to accumulated steam pressure within them from the choking of the outlet pipes with ice, while that pressure may be relieved and explosion prevented by a good safety-valve.

RECENT AMERICAN AND FOREIGN INVENTIONS.

Mill.—Mr. Theodule Michaut, of St. Paul, Minn., has patented an improved mill for grinding wheat, middlings, and other grains, so constructed as to produce more middlings and consequently more and better flour than mills constructed in the ordinary manner, which is so thoroughly ventilated that the surfaces do not become heated, which does not require frequent cracking and furrowing to keep it in order, and which may be run with a comparatively small amount of power.

Incubator Heater.—Mr. Frederick Meyer, of Philadelphia, Pa., has patented an improved heat regulator for incubators for automatically controlling the temperature of incubating chambers. It is an improvement on a heat regulator patented by Mr. Meyer, April 29, 1879, which consisted in a lever or balance carrying a tube, with reservoirs at each end containing ether and mercury. The mercury being shifted by the expansion or contraction of the ether, the lever is thereby moved to open or close a damper. In the use of this invention it was found that high winds tended to drive a portion of the heat through the radiating tubes and thus raise the temperature of the water. The present improvement obviates this disadvantage.

Bracelet.—Mr. Friedrich W. F. Kistner, of North Attleborough, Vt., has patented an improved bracelet, simply constructed, which locks itself automatically by means of a spring, and can be put on or taken off without requiring the hand to be passed through it. The bracelet is formed of a stiff hollow semi-circular part, to the ends of which two hollow quadrants are pivoted in such manner that they can swing in a plane at right angles to the plane of the bracelet, these quadrants being drawn inward or closed, when released, by a torsion-spring wire passing through the rigid and hinged parts of the bracelet.

Firearms.—Mr. Jepthah G. Dunlap, of Cedarville, Ohio, has invented an improvement in breech-loading firearms. A novel construction, arrangement, and operation of a bolt for locking the barrel in place, when the breech is closed, is supplied, and also devices for operating the bolt, together with means for preventing the accidental discharge of the gun before the barrel is locked in place, and preventing the accidental unshipping of the barrel from the stock.

Venetian Blinds.—Mr. John J. Angus, of Cascade, Wis., has patented a blind for windows in which the slats rest upon pins driven into the rabbet of the frame of the blind, and are held by pins driven into the blind rod, which is hinged to the cross pieces of the frame on the top and bottom, and the upper end of which fits into a recess in the upper cross piece of the blind. The slats are therefore devoid of tenons and are not attached to the central rod by staples as in ordinary blinds.

Wagons.—Mr. John S. Van Eps, of Mammoth City, Cal,, has patented an improved adjustable standard or stake for wagons, cars, or sleds, which is designed to afford convenience in loading or unloading such vehicles. Instead of inserting the stake or standard in a mortise or socket, after the usual fashion, the standard is provided with a horizontal metal socket or thimble, into which the end of the bolster is fitted, and is provided with means for holding it in an inclined or vertical position as desired.

Harrows.—Messrs. William G. Kennedy, Lecnard Z. Preston, Franklin A. Morand, and Edgar H. Kennedy, of Warren, Kansas, have patented a revolving harrow attachment for ploughs. The invention consists in attaching to the beam of a turn plough a frame in which a skeleton cylinder is set at slight incline to the line of draught and provided with teeth rearwardly inclined.

Hand Cultivator.—Mr. Henry B. Sherwood, of Westport, Conn., has patented a hand cultivator so constructed that the hoes can be adjusted at any desired inclination, will break up the crust or baked soil, and protect small plants from soil moved by the hoes. The hoes, being held down by spring pressure when at work, are prevented from jarring the operator when obstructions are encountered.

Seed Drill.—Mr. Daniel G. Martz. of Mauzy, Va., has patented a seed drill so constructed that under ordinary circumstances the shovel will be held to its work; but when the shovel meets an obstruction the boot will yield and swing back, and return to its place as soon as the obstruction is passed. The shovel may also be reversed and moved down or up as may be required.

Wind Motor.—Mr. Manuel de la Torre, of Mexico, Mexico, has patented a turbine wind motor which consists of a wheel with curved vanes rotating on a vertical axis within a cylindrical frame which is closed on two opposite sides. The wind entering the wheel on one side escapes at the other. The frame is controlled by vanes to admit more or less air to the wheel according to the velocity of the wind.

Printing Press.—Mr. John Till, of Canton, Pa., has patented an improved printing press constructed to perform easy, rapid, and accurate work. A four-sided frisket frame, which revolves one quarter of its circumference for each impression that is made by and between the rocking bed and the platen, is employed, together with other novel points of construction.

Spring for Vehicles.—Mr. Ethelbert J. Moore, of Villisca, Iowa, has patented a concussion spring for vehicles which consists of a rubber plate having upon its face rubber blocks in the shape of truncated pyramids placed between the bolster and bed of the vehicle, by which construction the shock of light or heavy loads is sustained with equal effectiveness.

A NEW CENTRAL STATION FOR LONDON.—We notice that a proposal is afoot to establish at the end of Northumberland-avenue a large central station for the use of the London and North Western, the Great Western, the London and South Western, and perhaps some other railways. The scheme, which is being actively taken up by Mr. Charles Waring, embraces also the construction of a line of railway which would extend in tunnel from the new station along the line of the Embankment to Westminster, where it would pass between the Houses of Parliament and the Abbey, and thence along the Millbank and Chelsea Embankments to a junction with the West London Railway near the present Chelsea Station. A branch also would leave the line just mentioned after it passed under the Vauxball-bridge-road, and rising alongside the Embankment, would cross the river obliquely by four spans of 230ft. each, and would join the London and South-Western Railway near the point where it is now crossed by the London, Chatham, and Dover. It will be seen that by the first-named line the London and North Western and the Great Western Railways would get good access to the Central Station, *viâ* Willesden and Kensington (Addison-road), while as regards the London and South Western Railway the distance from Clapham Junction to the Central Station would be slightly less than to Waterloo. Mr. Russel Aitkin and Mr. J. Wolfe Barry are the engineers to this scheme, while Mr. Charles Barry is, we understand, associated with the work as architect. That the site chosen for the proposed station is an admirably situated one with unusually good means of access there can be no doubt. The area which it is proposed to occupy would allow of a station about 430ft. in width, and of a length about equal to that of the Cannon-street Station. The proposed terminus would be a low level one, the rails being about 7ft. below the level of Northumberland-avenue, while access to the District Railway would be under the same roof. The District Railway itself it is proposed to divert to the westward, so that between Westminster and Charing-cross the new line would lie between the District Railway and the river, a branch from the new railway making a junction with the District at the present Charing-cross Station. The new Charing-cross Station of the District line would be on the south side of Northumberland-avenue, nearer Trafalgar-square than at present. It is stated that the worst gradient on the proposed railways will be but one in 70, while the sharpest curve will have a radius of 15 chains. The proposed lines have the great advantage of involving but trifling interference with house property, while one of them opens up the district be-between Westminster and Chelsea at present unprovided with railway accommodation. Altogether the scheme is an important one, and its development will be watched with interest.—*Engineering*.

JUTE.—Dundee, Scotland, is the greatest centre of the jute manufacture, and it is estimated that 170,000 tons of the fibre per annum are used there in the manufacture of bagging, &c. The industry was established about forty years ago, and in 1848 only 8,905 tons of jute were used. A large business in the manufacture of flax is also carried on at Dundee, and the two interests have given the city considerable prominence as a port. Between one and two hundred flax-laden vessels enter the harbour of Dundee each year. In the jute trade larger vessels are employed, and have included in recent years no less than twelve fine steamers. The exports of jute yarn from the United Kingdom in 1880 were over 16½ million pounds, and of jute cloths 183 million yards. But the supremacy of Dundee in the manufacture of jute goods has been seriously threatened of late by an increase in the production of such articles in British India, where the jute itself is grown.—*Journal of Applied Science.*

COMPRESSED AIR CLOCKS FOR LONDON.—There is a bill now before Parliament to give London the benefit of the system of compressed air clocks, which has been successfully and extensively established in Paris. The compressed air clocks consist of a new and very simple construction of the works of the ordinary timepiece, by which all the clocks of any city or town, however much separated and distant from each other, can be governed and wound up and regulated by means of a pneumatic air current and connecting mechanism that secures their regular going and their constant synchronization. The movement can be applied to all existing clocks or timepieces, wherever placed, and there may be either one central motor or several, according to the area of each municipality. If the system were adopted in London and the environs, as proposed by the bill already referred to, which has the consent and sanction of the City authorities and the Metropolitan Board of Works, the result would be that every clock embraced within the system, no matter where situated, would always indicate precisely the same time of the day or night. The number of stations proposed for the metropolis by the promoters of the bill now before Parliament is ten. The maximum charge for public clocks is not to exceed 12s. 6d. per annum.

DIFFUSION OF ALCOHOL IN NATURE.—It was shown by M. Muntz some time ago that alcohol in very small quantity could be detected in substances through the reaction which consists in changing it into iodoform. This method he has developed to extreme sensibility, so that the presence of less than one-millionth of alcohol added to water can be proved by it. M. Muntz has lately examined various waters in this way, spring, river, sea, and rain water; also snow. He finds alcohol in all except in very pure spring water. By comparison with water holding known quantities of alcohol, rain water and water of the Seine are estimated to contain about one gramme per cubic metre. Snow and cold rain seem to contain a little more. The proportion in sea-water is much the same. There is evident reason to suppose that alcohol exists in the state of vapour in air. This diffusion of the substance in nature is easily explained by the destruction of organic matter by various agents of fermentation. On this hypothesis one should find a good deal of alcohol in the ground. M. Muntz states that even poor soil gives the iodoform reaction when only 100 or 200 grammes are operated with; while mould and earth rich in organic matters contain the substance in considerable quantity. The iodoform reaction, indeed, is got with other volatile substances, such as ether, methylic alcohol, &c., but of all such substances ordinary or ethylic alcohol is the only one formed in nature in large quantity, so its extensive presence is more easily explained. In the case of earth it can be extracted and its essential properties verified.

NEW VIEWS ON DISEASE.—Some remarkable new facts have been elicited by M. Pasteur in the fruitful research on anthrax and other diseases of animals he is now engaged in. He finds it possible to weaken the virus of anthrax and to restore its virulence. It is explained that in artificial cultivation of the bacterium this parasite grows by multiplication of filaments, which give true spores or germs, and these germs are not affected in vitality or virulence by exposure to air. But by cultivation at 42deg. to 43deg. a growth without spores is obtained. After about a month this suddenly shows complete sterility, when sown, *e.g.*, in fresh broth, whereas up to that point the reproduction is easy. And its virulence during the first eight days proves to be gradually attenuated to complete extinction so that at the end of that time it is quite harmless, at least to the guinea pig, the rabbit, and the sheep. Similar effects in longer time were previously had with the microbe of chicken cholera, through cultivation in contact with air. Thus a means is afforded of giving animals a mild form of the disease, so as to obviate the intense and fatal form. Now, the secret of effecting a return of the virulence is successive cultivation in the bodies of certain animals. The bacterium, which is harmless for guinea pigs, is found not to be so for all ages of the animal. Thus it may do no harm to a guinea pig six days old, and yet may kill one which is one day old. By inoculation of a somewhat older animal with the blood of the younger and repeating this several times it becomes possible to kill adult guinea pigs and at length sheep, and M. Pasteur believes the effect may be extended to cows and horses. The virulence of chicken cholera may be restored by a similar process, inoculating first small birds then larger. The foregoing facts are thought to throw light on the spontaneous appearance of epidemics, the microbe germs of which may long remain harmless, till, under certain conditions of successive development, they become virulent and increasingly so. Further, a microscopic organism, supposed harmless for man, may, through like causes, acquire virulence for him.